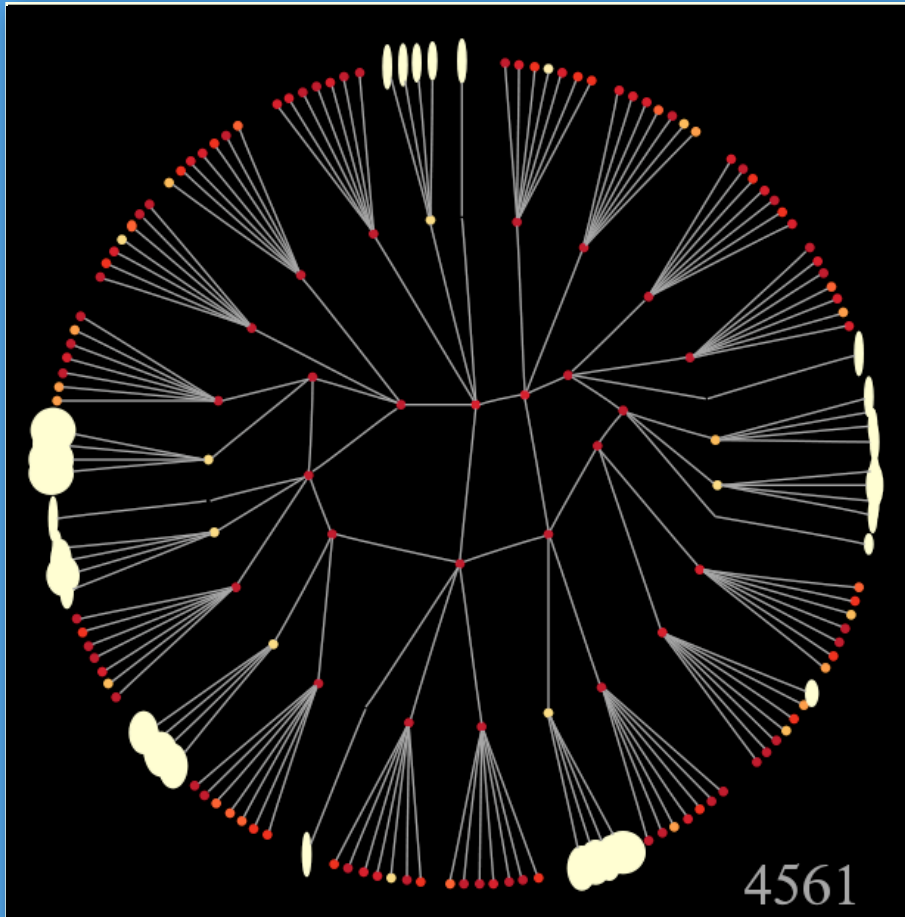Cedric Houard

John Hagedorn

complex systems

May

Visualizing Traffic and Congestion on the Abilene Network

4561

One frame from an animated visualization of a simulation of the "Abilene" network.

The innermost nodes are the backbone routers, the next ring represents the subnet routers, and the outermost ring shows the leaf routers. The color of each node corresponds to utilization (red is low, yellow is high). In addition, the leaf routers are drawn as ellipses where the vertical axis shows queue length and the horizontal axis shows packet loss. The time step within the simulation is shown in the lower right.

Animation available at:
math.nist.gov/mcsd/savg/vis/abilene/

Abstract—We have implemented tools for the visual investigation of network and computing grid simulation data. In this case, we look at the simulated behavior of the Abilene network. The network is represented by backbone, subnet, and leaf routers. These simulations enable us to consider how the characteristics of routers, connectivity, and data flow affect overall network behavior.

Attributes such as size, shape, color and brightness are easily distinguished by the user, and these can be presented in animated form to show time series data. These visualizations help us to look for patterns or properties that may be difficult to discern from the raw data.

Displays such as the one presented here have been implemented within a visualization tool that enables the researcher to interact with the data in a variety of ways. The user can select data items, assign them to a variety of visual attributes, probe the data for quantitative output, subset and zoom in on areas, data ranges, or times of interest, and so on.